

WHAT IS CLAIMED IS:

1. A drill string element for drilling a borehole with drilling fluid flowing in an annulus between the drill string and a wall of the borehole in a flow direction
5 along a longitudinal axis of the drill string going from a bottom end of the borehole towards the surface, the drill string element including at least one bearing zone for bearing against the wall of the borehole during drilling, wherein the bearing zone of the drill string
10 element comprises at least one bearing segment whose outside surface is cylindrical and of substantially constant outside diameter greater than the diameter of any other portion of the drill string element, together with a guide zone of convex curved shape tangential to
15 the bearing zone and presenting a meridian having a radius of curvature at all points that is not less than one-third the diameter of the bearing segment, the meridian extending axially in a disposition adjacent to the bearing segment of cylindrical surface.
- 20 2. A drill string element according to claim 1, wherein upstream from at least one bearing segment, the drill string element presents a drilling fluid guide zone tangential to the bearing segment whose convex outside surface presents a continuous curved meridian, in particular a circular meridian, having a radius of curvature that is not less than one-third the diameter of the bearing segments.
- 25 30 3. An element according to claim 1, wherein upstream and downstream from the bearing zone the outside surface of the drill string element comprises portions of generally convex shape having a radius of curvature not less than one-third the diameter of at least one bearing segment.
- 35 4. An element according to claim 3, wherein at least one of the convex surface portions of the outside surface of

the drill string element disposed upstream and downstream from the bearing zone includes grooves formed therein following helical dispositions around the axis of the drill string element.

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5. An element according to claim 1, wherein at least one segment of the bearing zone is of a length that is less than or equal to 80 mm.

10 6. A drill string element according to claim 1, further comprising, in a disposition adjacent to the bearing segment, a drilling fluid activation zone of circular symmetry about the axis of the drill string, having an outside surface presenting a meridian with a first portion and a second portion situated downstream from the first portion in the drilling fluid flow direction, said portions being generally inclined in opposite directions relative to the axial direction of the drill string, sloping towards the axis of the drill string and connected together by a meridian line of a minimum-diameter central section of the bearing zone.

25 7. A drill string element according to claim 6, wherein the bearing zone of the drill string element has a first bearing zone and a second bearing zone disposed downstream from the first bearing zone in the direction of drilling fluid flow in the annulus, and that the drilling fluid activation zone extends axially between the first bearing segment and the second bearing segment.

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35 8. A drill string element according to claim 6, wherein the first portion of the meridian of the activation zone of the bearing zone presents a general direction making a first angle α with the axial direction of the drill string that is less than a second angle β made between the general direction of the second portion of the

meridian of the outside surface of the activation zone and the axial direction of the drill string.

9. A drill string element according to claim 6, wherein
5 the drilling fluid guide zone comprises a portion downstream from the activation zone having as its meridian the second portion of the meridian of the activation zone.

10 10. A drill string element according to claim 6, wherein the outside surface of the drill string element has grooves machined therein, in the activation zone of the bearing zone in dispositions that are generally helical about the axis of the drill string element.

15 11. An element according to claim 6, wherein the outside surface of the central section of minimum diameter of the bearing zone includes cavities distributed around its periphery, preferably being machined to be undercut, so as to obtain a scoop effect for stirring the drilling fluid in the activation zone during rotation of the drill string.

25 12. A drill string element according to claim 1, wherein the outside surface of at least one segment of the bearing zone is covered by a covering of hardness that is much greater than the hardness of the base metal of the drill string element, the covering extending between first and second lines of contact between the outside surface of the bearing segment and one of the guide zone and of a portion of the activation zone tangential to the segment.

30 13. A drill string element according to claim 6, constituting a drill rod having upstream and downstream end coupling portions, and between the coupling portions at least one bearing zone having at least one bearing

segment and at least a guide zone and an activation zone adjacent to the bearing segment.

14. A drill string element according to claim 13,
5 comprising first and second bearing zones in dispositions that are adjacent respectively to its upstream end junction portion and its downstream end junction portion and at least one bearing zone between the bearing zones respectively adjacent to the upstream end junction portion and to the downstream end junction portion,
10 spaced apart in the axial direction of the drill rod away from the end junction portions.

15. A drill string element according to claim 13,
15 including, in a disposition adjacent to and upstream from the bearing zone, a cleaning zone in which the outside surface of the drill string element has cavities or grooves, preferably in helical dispositions, and including undercut portions.

20 16. A drill string element according to claim 15,
including, in its outside surface, a deflection surface at one end of the cleaning zone adjacent to the bearing zone of the drill rod.

25 17. A drill string element according to claim 13,
including, downstream from the bearing zone, a groove about the axis of the drill string element and including a deflection surface inclined relative to the axis of the drill string element towards the wall of the borehole, at an axial end of the groove remote from an adjacent end of the bearing zone.

35 18. A drill string element according to claim 6, having upstream and downstream end junction portions or tool joints, wherein each tool joint includes at least one bearing zone having at least one bearing segment and at

least a guide zone and a drilling fluid stirring zone adjacent to the bearing segment.

19. An element according to claim 18, including helical
5 grooves machined in the outside surface of the tool joint, preferably in helical dispositions with undercut portions, in at least one of the intermediate activation zone of the bearing zone and a zone adjacent to the bearing zone and upstream from the bearing zone.